Original article

Prevalence of polypharmacy and associated factors in older adults living in Rio Branco, Acre, Brazil: a cross-sectional population-based study, 2014

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Abstract

Objective: To analyze polypharmacy prevalence and associated factors in older adults living in Rio Branco, Acre, Brazil, in 2014. **Methods:** This was a cross-sectional population-based study using complex sampling with older adults. Polypharmacy was defined as concomitant use of five or more medications. **Results:** Polypharmacy prevalence was 14.9% (95%CI 11.8;18.6), positively associated with females (OR=2.29 – 95%CI 1.41;3.74), white race/skin color (OR=1.61 – 95%CI 1.10;2.38), dependence (OR=1.65 – 95%CI 1.05;2.60), change in eating habits/dieting (OR=1.66 – 95%CI 1.16;2.36), hospitalization in the last 12 months (OR=1.61 – 95%CI 1.02;2.53) and presence of the following self-reported morbidities: systemic arterial hypertension (OR=2.40 – 95%CI 1.33;4.34), diabetes *mellitus* (OR=2.17 – 95%CI 1.23;3.84), osteoporosis (OR=2.92 – 95%CI 1.84;4.64) and heart problems (OR=2.94 – 95%CI 1.90;4.56). **Conclusion:** This study found that polypharmacy in the older adults was associated with demographic and health conditions.

Keywords: Polypharmacy; Aged; Prevalence; Drug Utilization; Cross-sectional Studies.

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Introduction

In Brazil in 2015 life expectancy at birth was 75.4 years and the proportion of people accounted for 14.3% of the population, whereas only 10 years earlier, in 2005, they accounted for 9.8% of the population. The proportion of Brazilians in 2039 is projected to be 24%.[1]

> *Occurrence of polypharmacy, defined as concomitant use of five or more medications, is related to people needing more medication and its consequences include increased incidence of adverse reactions (to medication), such as urinary incontinence, drug interactions and hospitalizations, in addition to the cost of treatment and mortality.*

In general, people have a multiplicity of chronic morbidities, this being a fact which makes the treatment process complex due to bodily changes related to age, sex, reduction in cognitive and sensorial abilities, as well as greater difficulty in adhering to treatment.[2]

Polypharmacy can be associated with aging.[3] Occurrence of polypharmacy, defined as concomitant use of five or more medications, is related to people needing more medication and its consequences include increased incidence of adverse reactions (to medication), such as urinary incontinence, drug interactions and hospitalizations, in addition to the cost of treatment and mortality.[4]

Polypharmacy prevalence in the rose from 13.0% to 40.0%, between 1988 and 2010, in the United States.[5] In Brazil, between 2013 and 2014, polypharmacy prevalence was 18.0%, and was associated with demographic aspects and morbidities.[6]

Population-based studies aiming to assess the profile of medication use by the in Brazil are needed, principally in the Amazon region, due to peculiarities which include high levels of illiteracy and difficulties in accessing health services in the region.[7] High polypharmacy prevalence and scarcity of studies on its characteristics, as well as regional differences, motivated this study, the objective of which was to analyze polypharmacy prevalence and associated factors in older adults in Rio Branco, Acre, Brazil.

Methods

This study is comprised of a population-based survey conducted with people, i.e. over 60 years old, covering the urban and rural areas of the municipality of Rio Branco, capital of the state of Acre, between April and September 2014, focusing on estimated polypharmacy prevalence.

In 2010, the municipality of Rio Branco covered an area of 8,834.942km², with approximately 21,620 people, mostly living in its urban area (91.8%). In the same year, Rio Branco reached a human development index of 0.727,[8] and what most contributed to this was the longevity of its citizens. The index for longevity was 0.798, followed by income (0.729) and education (0.661).

Eligible study participants comprised all over 60 years old, of both sexes, resident in Rio Branco. Those who had some form of cognitive impairment in relation to communicating and understanding the questions, as identified by the interviewer or as informed by family members, were excluded from the study.

Participants were selected by probabilistic sampling in two stages: census enumeration area (CEA) and household. In order to select the census enumeration area (CEA), we used probability proportional to the number of private households recorded by the 2010 Demographic Census, conducted and published by the Brazilian Institute of Geography and Statistics (IBGE). When selecting the households, we used systematic sampling which began randomly and had different intervals in each.

Probabilistic selection of the sample of elderly people followed cluster sampling procedures in two stages. Once the sample was defined, we selected 40 (out of a total of 338), as is usual in epidemiological studies using sampling based on. Selection of the sectors was done using probability proportional to size (PPS), to make allowance for size differences between clusters. As such, 73 households were selected independently with equal intervals in each by means of systematic sampling and all elderly residents were interviewed. Details of the sampling plan, sample size and sample weighting calibration have been published previously.[9]

The interviews took place in each household and included administration of a questionnaire which was structured into thematic modules with the following variables:

a) Socioeconomic and demographic variables

- Age (in years: 60-69; 70-79; 80 and over);
- Sex (male; female);
- Race/skin color (white; non-white [brown, black, yellow and indigenous]);
- Schooling (no schooling; complete elementary education; complete high school education; higher education);
- Marital status (with partner; without partner).

b) Behavior and health (self-reported) variables

- Practices physical activity (yes; no);
- Change in eating habits/dieting (yes; no);
- Chronic diseases (arterial hypertension; diabetes *mellitus*; arthritis/arthrosis; osteoporosis; heart problems; dyslipidemia; depression);
- Self-rated health (very good/good; regular; poor/very poor);
- Hospitalized in the last 12 months (yes; no);
- Degree of independence (dependent; independent);
- Body mass index (BMI, in kg/m²: ≤27kg/m²; >27kg/m²);
- Signs and symptoms of depression (yes; no);
- Polypharmacy (yes; no).

The interviews enabled data collection. The interviewers were duly qualified and trained in a specific course and were either students of health-related courses or health professionals. A manual containing guidelines was prepared and provided to the interviewers with the aim of standardizing the interviews. Data collection was supervised by the study coordinator.

In order to investigate each person's degree of independence, the Instrumental Activities of Daily Living (IADL) scale was used. The scale is comprised of eight activities: doing housework; doing laundry; cooking; shopping; using the phone and looking up numbers; driving or using public transportation; managing finances; and managing medications.[10] Based on this scale of activities and respective scores, elderly people who scored 27 points were classified as independent, while those who scored 26 points or less were classified as dependent.

Signs and symptoms of depression were investigated using the Geriatric Depression Scale.[11] The scores of this scale range from 0 to 15, whereby scores of 6 or over are considered to be suggestive of depression. When analyzing body mass index (BMI), the cut-off points of the Nutrition Screening Initiative (NSI) for overweight people were considered: BMI >27kg/m².[12] This cut-off point takes into consideration body changes resulting from aging.[12] Physical assessment was performed in order to determine BMI, involving collecting anthropometric data on the participants: weight and height. Weight was measured using G-Tech® Bal Gl 200 digital weighing scales, with 50 gram resolution, placed on a stable and level surface. Height was measured using a portable Sanny® stadiometer, with resolution in millimeters, also placed on a stable and level surface.

Data on current medication use was obtained by asking the following questions:

"*Are you taking medication? If so, which medications, dosage and frequency?*"

Medication with prolonged use was identified by asking the question:

"*Are you taking any of these medications continuously (for a month or more)?*"

Medication use was verified as to active ingredient, dosage and frequency, by checking the prescription or packaging of all medication in use at the time participants were assessed. Medications were categorized using the Anatomical Therapeutic Chemical Code (ATC) adopted by the World Health Organization.[13]

The dependent variable was polypharmacy, defined as 'concomitant use of 5 or more medications', dichotomized into 'Yes' (use of 5 or more medications) and 'No' (use of 0 to 4 medications). The variables analyzed were: sex; age; schooling; presence of self-reported morbidities; self-rated health; degree of independence; signs and symptoms suggestive of depression; obesity; and practicing physical activity.

A pilot study, in which 30 were interviewed and received physical assessment, was conducted for the purpose of controlling the quality of the information.[14]

The sample size was calculated based on prevalence of kidney function changes among elderly people – 40% – as indicated in international studies,[14] considering the population of 23,416 estimated to be resident in Rio Branco on July 1st 2014, taking a 95% confidence interval and absolute error of 3 percentage points. As the sampling plan followed the procedures for complex sampling, a design effect of 1.95 was used, thus resulting in an estimate of 1,020 elderly people.

Descriptive analyses were made of the data, expressed in absolute and relative frequencies, in order to characterize the population studied. Analysis of the differences between proportions was based on Pearson's chi-square test.

Association between use of medication and the independent variables was ascertained by crude and adjusted analysis, using logistic regression, to facilitate comparison with the results of other studies, using the hierarchical odds ratio (OR) model of measures of association. We used a process of modeling by blocks in which polypharmacy was initially adjusted by the 'sex' and 'race/skin color' distal variables. The 'degree of independence', 'overweight' and 'change in eating habits/dieting' variables were introduced in the intermediate block, while the variables relating to health conditions were incorporated into the proximal block, with the aim of controlling possible confounding factors. Adjustment was initially performed within each level of the model by including variables with $p<0.10$ in the bivariate analysis. Variables that reached $p<0.05$ were kept in the final model. A 5% significance level analyzed by the Wald test was adopted.

The SAS statistical package (version 9.4) was used. All the analyses took into account the sample design effect and the calibrated weights of the observations; the results obtained took the calibrated weights into consideration with the aim of their being extrapolated to the population by 'estimation (n)'. To this end the maximum pseudolikelihood method was used, considering the sample weights and the structural information of the sample plan. The inferences were assessed using the Wald statistic, based on the sample plan, along with F distribution.

The study project was approved by the Federal University of Acre Human Research Ethics Committee: Opinion No. 518.531, issued on January 30th 2014; Certificate of Submission for Ethical Appraisal No. 17543013.0.0000.5010. The study participants signed a Free and Informed Consent form and their right to refuse to take part and to have their data kept confidential was guaranteed.

Results

Out of the sample of 1,016 interviewees, there was a total of 59 losses and refusals, resulting in an expanded population of 23,416. Polypharmacy prevalence in that population was 14.9% (95%CI 11.8;18.6).

Polypharmacy was more frequent among women, individuals of white race/skin color, those who had no partner and older elderly people. Among sedentary individuals, there was 14.3% polypharmacy, while it was 21.9% among those who changed their eating habits/dieting (Table 1).

The proportion of those who had been hospitalized in the last 12 months was 16.6%. Among those with polypharmacy, this prevalence rate was 23.7% (Table 1). The main reasons for hospitalization were changes to arterial pressure (23.7%), followed by heart problems (17.9%), infections (14.1%), surgery (13.7%) and strokes (10.2%).

There was higher prevalence of polypharmacy among those who reported poor and very poor self-rated health, those with signs and symptoms of depression, those who were considered to be dependent according to IADL, those who were obese; and those who self-reported arterial hypertension, diabetes *mellitus*, insomnia, arthritis/arthrosis, osteoporosis, heart problems, dyslipidemia and depression (Table 1).

In the analysis adjusted by hierarchical level, the following variables kept their statistical significance on the intermediate level: female sex; white race/skin color; dependence according to IADL; and change in eating habits/dieting. The following variable remained in the third model (proximal level): white race/skin color; dependence according to IADL; hospitalized in the last 12 months; and self-reported morbidities – arterial hypertension, diabetes mellitus, osteoporosis and heart problems (Table 2).

Discussion

Polypharmacy prevalence was lower in Rio Branco, Acre, when compared to prevalence rates found by other studies.[5,6] The associated factors on the distal level were female sex and being of white race/skin color; on the intermediate level, the associated factors were found to be dependence, according to the Instrumental Activities of Daily Living (IADL) assessment, and change in eating habits and/or dieting. On the proximal level, the following were found to be associated with polypharmacy: hospitalized in the last 12 months and presence of these self-reported morbidities: systemic arterial hypertension, diabetes *mellitus*, osteoporosis and heart problems.

The prevalence rate found by this study is lower than that found in other developed countries, as can be seen in a study conducted in 2011 with a population of 12,301,537 Italians aged 65 or over, among

Table 1 – Participants' characteristics and polypharmacy prevalence according to sociodemographic variables, lifestyle habits, health conditions and morbidities in older adults (n=1,016), Rio Branco, Acre, Brazil, 2014

Variables	Total		Polypharmacy		p-value[b]
	Estimate (n)	% (95%CI[a])	Estimate (n)	% (95%CI[a])	
Sex					0.001
Male	10,896	46.5 (43.4;49.7)	1,040	9.5 (6.2;14.5)	
Female	12,520	53.5 (50.3;56.6)	2,452	19.6 (15.6;24.3)	
Age (years)					0.303
60-69	13,394	57.2 (54.7;59.7)	1,810	13.5 (9.8;18.4)	
70-79	6,687	28.6 (26.2;31.1)	1,054	15.8 (11.4;21.4)	
≥80	3,335	14.2 (12.2;16.6)	628	18.8 (13.7;25.4)	
Race/skin color					0.017
Non-white	5,614	76.0 (71.8;79.8)	1,127	13.3 (10.1;17.3)	
White	17,802	24.0 (20.2;28.2)	2,365	20.1 (15.0;26.3)	
Marital status[c]					0.721
With partner	9,086	39.1 (35.7;42.6)	1,305	14.4 (9.8;20.6)	
Without partner	14,172	60.9 (57.4;64.3)	2,187	15.4 (12.0;19.6)	
Schooling[c]					0.620
No schooling	17,471	75.2 (68.4;81.0)	2,612	15.0 (11.5;19.2)	
Elementary education	1,963	8.5 (6.2;11.5)	301	15.3 (9.8;23.2)	
High school education	2,802	12.1 (9.1;15.8)	380	13.5 (8.1;21.7)	
Higher education	987	4.2 (2.7;6.7)	199	20.2 (11.2;33.6)	
Practices physical activity[c]					0.178
Yes	3,480	14.9 (11.9;18.4)	655	18.8 (12.0;28.3)	
No	19,904	85.1 (81.6;88.1)	2,837	14.3 (11.4;17.7)	
Change in eating habits/dieting					<0.001
Yes	7,372	35.6 (32.4;39.0)	1,611	21.9 (16.3;28.7)	
No	13,327	64.4 (61.0;67.6)	1,395	10.5 (7.8;13.8)	
Hospitalized in the last 12 months[c]					0.001
Yes	3,746	16.6 (20.0;33.2)	890	23.7 (17.7;31.1)	
No	18,868	83.4 (81.2;85.5)	2,526	13.4 (10.3;17.2)	
Self-rated health					0.014
Very good/good	8,598	36.7 (33.4;40.1)	856	10.0 (6.7;14.6)	
Regular	11,208	47.9 (44.7;51.0)	1,770	15.8 (11.3;21.6)	
Poor/very poor	3,610	15.4 (12.9;18.3)	866	24.0 (15.4;35.3)	
Signs and symptoms of depression[c]					0.002
Yes	7,558	32.5 (28.9;36.4)	1,462	19.3 (15.0;24.5)	
No	15,666	67.5 (63.6;71.1)	2,030	13.0 (9.9;16.9)	
Degree of independence[c]					0.003
Independent	11,907	51.1 (46.7;55.5)	1,350	11.3 (7.9;16.0)	
Dependent	11,402	48.9 (44.5;53.3)	2,142	18.8 (14.9;23.4)	
Body mass index (BMI: kg/m²)[c]					0.027
≤27	11,321	51.4 (46.2;56.5)	1,388	12.3 (9.0;16.6)	
>27	10,714	48.6 (43.5;53.8)	1,923	17.9 (13.5;23.4)	

a) 95%CI: 95% confidence interval; b) Wald test; c) Data missing in this variable due to it not being answered; d) Fibrillation, arrhythmia and heart failure.

To be continued.

Continuation.

Table 1 – Participants' characteristics and polypharmacy prevalence according to sociodemographic variables, lifestyle habits, health conditions and morbidities in older adults (n=1,016), Rio Branco, Acre, Brazil, 2014

Variables	Total		Polypharmacy		p-value[b]
	Estimate (n)	% (95%CI[a])	Estimate (n)	% (95%CI[a])	
Morbidities					
Arterial hypertension[c]					<0.001
Yes	13,958	59.8 (56.3;63.2)	2,804	20.1 (16.3;24.6)	
No	9,377	40.2 (36.8;43.7)	646	6.9 (4.3;10.9)	
Diabetes *mellitus*[c]					<0.001
Yes	4,060	17.7 (15.3;20.2)	1,211	29.8 (23.1;37.6)	
No	18,933	82.3 (79.8;84.7)	2,260	11.9 (9.1;15.6)	
Insomnia[c]					0.003
Yes	8,039	34.4 (31.6;37.3)	1,529	19.0 (14.7;24.3)	
No	15,333	65.6 (62.7;68.4)	1,963	12.8 (9.8;16.6)	
Arthritis/arthrosis[c]					<0.001
Yes	3,679	16.0 (13.1;19.5)	1,034	28.1 (21.0;36.5)	
No	19,251	84.0 (80.5;86.9)	2,399	12.5 (9.4;16.4)	
Osteoporosis[c]					<0.001
Yes	3,453	15.1 (12.7;17.8)	1,108	32.1 (24.5;40.8)	
No	19,473	84.9 (82.2;87.3)	2,300	11.8 (9.0;15.3)	
Heart problems[d]					<0.001
Yes	2,432	10.4 (8.4;12.8)	814	33.5 (24.8;43.4)	
No	20,984	89.6 (87.2;91.6)	2,678	12.8 (10.0;16.1)	
Anemia[c]					0.284
Yes	1,726	7.5 (5.9;9.7)	326	18.9 (11.3;29.8)	
No	21,153	92.5 (90.3;94.1)	3,082	14.6 (11.5;18.3)	
Dyslipidemia[c]					<0.001
Yes	3,251	14.0 (11.9;16.5)	877	27.0 (19.3;36.4)	
No	19,897	86.0 (83.5;88.1)	2,597	13.1 (10.3;16.4)	
Depression[c]					0.003
Yes	2,736	11.9 (9.6;14.5)	677	24.7 (17.2;34.3)	
No	20,316	88.1 (85.5;90.4)	2,783	13.7 (10.7;17.4)	
Total	**23,416**	**100.0**	**3,492**	**14.9 (11.8;18.6)**	

a) 95%CI: 95% confidence interval; b) Wald test; c) Data missing in this variable due to it not being answered; d) Fibrillation, arrhythmia and heart failure.

Table 2 – Polypharmacy odds ratio (OR) and 95% confidence interval (95%CI) among older adults (n=1,016), by variables, Rio Branco, Acre, Brazil, 2014

Variables	$_{crude}$OR[a] (95%CI[b])	p-value	$_{adjusted}$OR[a] (95%CI[b])	p-value
	Distal level			
Sex		0.001		0.00[d]
Male	1.00		1.00	
Female	2.31 (1.42;3.76)		2.29 (1.41;3.74)	

a) OR: odds ratio; b) 95%CI: 95% confidence interval; c) Fibrillation, arrhythmia and heart failure; d) Distal level (OR adjusted by sex and race/skin color); e) Intermediate level (OR adjusted by variables that were significant in the preceding model plus self-rated health, BMI, change in eating habits/dieting, signs and symptoms of depression and being dependent); f) Proximal level (OR adjusted by variables that were significant in the preceding model plus hospitalized in the last 12 months and self-reported morbidities).

To be continued.

Continuation.

Table 2 – Polypharmacy odds ratio (OR) and 95% confidence interval (95%CI) among older adults (n=1,016), by variables, Rio Branco, Acre, Brazil, 2014

Variables	$_{crude}OR^{a}$ (95%CI[b])	p-value	$_{adjusted}OR^{a}$ (95%CI[b])	p-value
Race/skin color		0.017		0.016[d]
Non-white	1.00		1.00	
White	1.64 (1.09;2.45)		1.61 (1.10;2.38)	
Intermediate level				
Degree of independence		0.003		0.029[e]
Independent	1.00		1.00	
Dependent	1.81 (1.24;2.64)		1.65 (1.05;2.60)	
Body mass index (BMI: kg/m²)		0.027		0.164[e]
≤27	1.00		1.00	
>27	1.57 (1.06;2.32)		1.37 (0.87;2.16)	
Change in eating habits/dieting		<0.001		0.003[e]
No	1.00		1.00	
Yes	2.39 (1.66;3.45)		1.66 (1.16;2.36)	
Signs and symptoms of depression		0.002		0.144[e]
No	1.00		1.00	
Yes			1.31 (0.91;1.90)	
Self-rated health		0.014		0.240[e]
Very good/good	1.00		1.00	
Regular	1.70 (1.03;2.79)		1.46 (0.82;2.60)	
Poor and very poor	2.85 (1.38;5.89)		2.06 (0.85;4.99)	
Proximal level				
Hospitalized in the last 12 months		0.001		0.041[f]
No	1.00		1.00	
Yes	2.01 (1.38;2.94)		1.61 (1.02;2.53)	
Self-reported morbidities				
Arterial hypertension		<0.001		0.005[f]
No	1.00		1.00	
Yes	3.39 (2.16;5.35)		2.40 (1.33;4.34)	
Diabetes *mellitus*		<0.001		0.009[f]
No	1.00		1.00	
Yes	3.14 (2.13;4.62)		2.17 (1.23;3.84)	
Insomnia		0.003		0.671[f]
No	1.00		1.00	
Yes	1.60 (1.19;2.15)		1.09 (0.73;1.64)	
Arthritis/arthrosis		<0.001		0.320[f]
No	1.00		1.00	
Yes	2.74 (1.74;4.32)		1.39 (0.72;2.69)	

a) OR: odds ratio; b) 95%CI: 95% confidence interval; c) Fibrillation, arrhythmia and heart failure; d) Distal level (OR adjusted by sex and race/skin color); e) Intermediate level (OR adjusted by variables that were significant in the preceding model plus self-rated health, BMI, change in eating habits/dieting, signs and symptoms of depression and being dependent); f) Proximal level (OR adjusted by variables that were significant in the preceding model plus hospitalized in the last 12 months and self-reported morbidities).

To be continued.

Continuation.

Table 2 – Polypharmacy odds ratio (OR) and 95% confidence interval (95%CI) among older adults (n=1,016), by variables, Rio Branco, Acre, Brazil, 2014

Variables	OR^{a}_{crude} (95%CI[b])	p-value	$OR^{a}_{adjusted}$ (95%CI[b])	p-value
Osteoporosis		<0.001		<0.001[f]
No	1.00		1.00	
Yes	3.53 (2.44;5.10)		2.92 (1.84;4.64)	
Heart problems[c]		<0.001		<0.001[f]
No	1.00		1.00	
Yes	3.44 (2.30;5.14)		2.94 (1.90;4.56)	
Dyslipidemia		<0.001		0.451[f]
No	1.00		1.00	
Yes	2.46 (1.71;3.53)		1.24 (0.70;2.19)	
Depression		0.003		0.679[f]
No	1.00		1.00	
Yes	2.07 (1.30;3.30)		1.11 (0.66;1.88)	

a) OR: odds ratio; b) 95%CI: 95% confidence interval; c) Fibrillation, arrhythmia and heart failure; d) Distal level (OR adjusted by sex and race/skin color); e) Intermediate level (OR adjusted by variables that were significant in the preceding model plus self-rated health, BMI, change in eating habits/dieting, signs and symptoms of depression and being dependent); f) Proximal level (OR adjusted by variables that were significant in the preceding model plus hospitalized in the last 12 months and self-reported morbidities).

whom polypharmacy prevalence was 49.0%;[15] or the prevalence rate of 39.0% found in the United States, in a National Health and Nutrition Survey (1988-2010) with a sample of 13,869 people ≥65 years.[5] On the other hand, the rate found by our study is higher than that found by a population-based study conducted in Cuiabá in 2012 (10.3%)[16] with 573; while it is similar to a study conducted in the Belo Horizonte metropolitan region (14.%)[17] with 1,598 in 2003. However, the estimated prevalence found in our study with in Rio Branco was lower than that found by a study conducted in 2006 with individuals aged 65 and over living in São Paulo: 36.0%.[18] The above information indicates that polypharmacy prevalence in Brazil is heterogeneous and varies considerably according to geographic region. This heterogeneity may result from socioeconomic conditions and health care models adopted, as well as cultural, demographic and health status factors involved.[17]

Being of the female sex kept association with polypharmacy in Rio Branco, as was also found by a study conducted in São Paulo city with 1,115 participant aged 65 and over.[18] This fact may be related to the higher number of chronic morbidities and, consequently, women seeking health care more. Here it is appropriate to remember what has already been recognized: women are more concerned about their health condition and live longer than men.[17]

People considered to be dependent reported higher polypharmacy prevalence than people who were more independent, given that a larger number of morbidities is found in dependent people, thus increasing their demand for medications.[19] A study conducted in Ireland between 2009 and 2011 with 3,499 people aged 65 and over, concluded that simultaneous use of five or more medications resulted in association with instrumental activities of daily living (OR=1.68 – 95%CI 1.04;2.70). That study also noted the importance of preventive actions for changeable factors associated with functional limitations.[20] It should be emphasized that for the most part medication use is appropriate. However, its improper use is a dangerous reality, especially for the functional health of the.

Greater polypharmacy prevalence was also found among individuals who had changed their eating habits or who dieted regularly. This information may be explained, albeit partially, by receipt of guidance on changing eating habits or prescription of a specific diet, as a response to prior diagnosis of diseases related to obesity. Weight loss results in improved arterial pressure and blood glucose levels[21] and thus favors disease control and the result expected from treatment with medication. In our study, given its temporality limitation, it was not possible to identify the effect of this change on diet.

Prevalence of hospitalization increases with age, due to degenerating health status, thus generating more demand for treatment with medication. Having been hospitalized in the last twelve months showed positive association with polypharmacy, as also reported by another study.[18] Cardiovascular complications are among the leading causes of hospitalization, in this study, and are related to aging, which favors arteriosclerosis, reduction in aortic distensibility and that of the great arteries, impairment of cardiac conduction and reduction in the baroreceptor function.[22]

In Rio Branco, arterial hypertension and heart problems (fibrillation, arrhythmias and heart failure) were most prevalent among the self-reported morbidities. The effects of age on the circulatory system, already observed elsewhere, as well as diabetes *mellitus* and osteoporosis were also found. These morbidities are highly prevalent in Brazil and, in most cases, require continuous use of medication.[23]

Diabetes *mellitus* is a serious chronic morbidity, can lead to complications and requires continuous medication to control it.[24] Among the adequate self-control of blood glucose is infrequent, thus increasing the risk of hypoglycemia or hyperglycemia and, as a consequence, microvascluar and macrovascular complications which result in polypharmacy. Targets for improving quality of life and increasing life expectancy should be the health focus for elderly diabetic patients. They are possible to achieve, by continually controlling blood glucose levels, which in turn requires a joint effort on the part of health workers, family members, carers and patients themselves.[25]

As age advances, manifestation of osteomuscular problems is recurrent and they can result in disabilities and morbidity and mortality. Another study found association between osteoporosis and greater intake of medication among people, as well as abusive medication intake being associated with the appearance of osteoporosis.[26]

Regardless of which morbidity, the choice of medications for treating and controlling diseases in the should be based on joint decision making, taking into consideration presence of comorbidities, polypharmacy, physical frailty and potential adverse effects. In this way, patients are guaranteed awareness not only of the benefits but also possible complications resulting from using the medications indicated. Use of electronic medical records helps health professionals involved in prescribing medication to identify risk of adverse health events and complications, and in this sense it is important to implement medication safety management programs[27] aimed at the safe, efficacious and adequate use.

It is essential to eliminate any uncertainties about treatment regimens that the their carers and family members may have and this requires providing precise information. In addition, health professionals must assess both the need to treat symptoms or adverse events, and also the need to prescribe more than five medications for a patient; and always ask about and check what medication they are using, before prescribing new medication.[28]

This cross-sectional population-based study with a sample of non-institutionalized older adults living in Rio Branco, Acre, revealed polypharmacy prevalence in this population and associated factors. Given this study design, it is appropriate to recognize limitations inherent to it. Firstly, causality between the variables studied cannot be confirmed. Moreover, the data on morbidities were self-reported, so that lack of information about the amount of time that has passed since diagnosis may be a confounding factor for polypharmacy; however, the need for self-reporting, with the aim of obtaining more reliable information, led to the researchers opting for this exclusion criterion. Finally, excluding individuals with cognitive and communication impairment may have underestimated the prevalence rate found.

Polypharmacy prevalence was lower than that found for Brazil as a whole, and was more frequent among women, people who self-reported their race/skin color as being white, those who were dependent, those who had changed their eating/dieting habits, those who were hospitalized in the last 12 months and those with systemic arterial hypertension, diabetes *mellitus*, osteoporosis and heart problems. These social segments, identified as groups more vulnerable to polypharmacy, require drug safety actions capable of avoiding unwanted effects of medication on their health.

Authors' contributions

Rezende GR, Amaral TLM, Amaral CA, Vasconcellos MTL and Monteiro GTR took part in the concept and design of the study, data analysis and interpretation,

drafting the manuscript and reviewing its contents. All the authors have approved the final version of the manuscript and declare themselves to be responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

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